LIVE CIRCUIT INDICATOR FOR PLUGS AND RECEPTACLES

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority pursuant to 35 U.S.C. 119(e) from U.S. Provisional Patent Application having application No. 60/450,961, filed February 28, 2003.

BACKGROUND OF THE INVENTION

1. Field

This invention relates generally to electrical connectors and more particularly to a means for indicating that the contacts of a plug or receptacle are electrically connected to a live source of power.

SUMMARY OF THE INVENTION

The present invention relates to a method and apparatus for indicating that the line contacts of a connector are electrically connected to a live source of power. In the invention, a live circuit indicator module has an LED/resistor/diode series circuit connected between the tops of the line contacts of a receptacle or prongs of a plug to indicate if the prongs or contacts are connected to a live source of power. In operation, the LED of the series circuit shows by glowing that the prongs of a plug or connectors of a receptacle are actually connected to a live source of power.

In this invention, the electrical connector, such as a plug, has at least two blades or prongs for insertion into a receptacle. An electrical cable having at least two line conductors and a ground conductor extends into the housing of the plug and is connected directly to the blades of the plug. A live circuit indicator module is located within the plug for indicating, by means of a light, such as that generated by an LED, that the line

prongs of the plug are connected to a live source of power. The housing includes at least one opening located adjacent to the light source located within the plug to provide a visual indication to a user that the prongs are connected to a live source of power. As used herein, the term live source of power is understood to mean that the prongs are connected to a source of potential of, for example, 115V, 120V, 240V more or less etc.

The module for indicating that the prongs are connected to a live source of power is self contained, can be pre-assembled and is located within the plug to become an integral part of the plug before the prongs of the plug are connected to the electrical line conductors. The series circuit of the live circuit indicator module is electrically coupled to the prongs by means of spring contacts which are located in passageways in the module and the back cover to connect the LED/resistor/diode series circuit on the module directly to the prongs of the plug. The spring contacts extend through the insulating body member of the module on which the series circuit is located. In operation, when the prongs of the plug are connected to a source of potential, the LED will glow. In the absence of a potential on the prongs of the plug, the LED will not glow. Thus, with this invention, a user can readily determine if power is being applied not just to the plug, but to the blades of a plug by looking for the light in the plug. If the LED is lit, then the prongs of the plug are connected to a live source of power.

The housing of the plug contains alignment means for positioning the light emitting means next to an opening in the cover of the plug to insure that a user can see if the light emitting means is on or off.

With this invention a user can readily determine if power is being applied to the contacts of a plug or receptacle by looking for a light in the window of the plug.

This invention has been described in relation to a plug form of electrical connector, it being understood however, that other types of electrical connectors such as electrical receptacles, screw type connectors or any similar form of electrical connector may utilize the live circuit indicator module here disclosed. Further, it is to be understood that this invention can be used with two, three or four wire conductor cables

for determining if the prongs of a plug or a receptacle are connected to a live source of power.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other features of the invention will become apparent upon a consideration of the accompanying drawings forming a part of this specification and in which:

Fig. 1 is a side elevation partially exploded view of one form of electrical connector incorporating a live circuit indicator module for indicating if the prongs of a plug are connected to a live source of electrical power in accordance with the principles of the invention;

Fig. 2 is a bottom view of the plug of Fig. 1 showing the ground prong and the two line prongs;

Fig. 3 is a side elevation view of the back cover of the plug which is located above the prongs of the plug and below the live circuit indicator module;

Fig. 4 is a top view of the live circuit indicator module showing the series circuit for indicating if the prongs of the plug or connected to a live source of electrical power;

Fig. 5 is a side elevation view of the cover of the top portion of the plug;

Fig. 6 is a side elevation view of the lower portion or body of the plug showing spring contacts about to be placed into passageways in the back cover to make electrical contact with the tops of the line prongs that are to be connected to line conductors;

Fig. 7 is a side elevation partially exploded view showing how the live circuit indicator module fits on the top of the back cover;

Fig. 8 is a side elevation view of the body of the plug including the live circuit indicator module ready for positioning within the cover; and

Fig. 9 is an exploded elevation view of the body of the plug showing the two contact spring about to be inserted into the openings in the back cover to provide a

conductive path between the prongs of the plug and the circuit on the live circuit indicator module.

DETAILED DESCRIPTION

FIG. 1 shows a partially exploded view of one form of an electrical connector within which a live circuit detector module for indicating the presence of electrical power at the prongs of a connector such as a plug in accordance with the principles of the invention. The plug 10 has a cover 12 adapted to be positioned over the top portion of the plug 10 and secured firmly to the body 16 with screws 24. The plug supports a pair of prong or blade contacts and a ground contact blade (not illustrated) which extend outward from the bottom surface of the plug to provide a standard three blade grounded plug. Power is supplied to the plug by a three wire conductor (not illustrated) having two line conductors and a ground conductor which extend into the cover and connect to the line contact blades and the ground contact blade. A clamping means is provided to hold the three wire conductor in position relative to the plug 10.

In accordance with the invention, at least one window opening 14 is provided in the cover 12. The window extends into the hollow interior of the cover. A light generating means such as an LED located on a live circuit detector module is positioned behind the window and is visible through the window opening 14.

The wires of the conductor are stripped of insulation at the ends and are inserted into the openings 30 for attachment to the prongs of the plug. The inward end of each prong includes a connection screw and a clamp assembly for securing a conductive lead wire in electrical contact with the prong. In a similar manner, inward end of ground contact blade includes a screw and clamp assembly for connecting a ground lead wire thereto. Insertion of the wires into openings 30 and clamping the wires to the prongs electrically connects each wire to a prong of the plug.

Referring to Fig. 2, there is illustrated a bottom view of the plug of Fig. 1 showing three prongs where prong 16 is the ground contact and prongs 18 and 20 are the line

contacts. Three screws 24, see Fig. 1, extend from the bottom surface through the body 16 of the plug to engage the cover 12. Tightening the screws 24 locks the cover 12 to the body 16 where the lower edge 26 of the cover engages the upper edge 28 of the body of the plug. Alignment means is provided to align the cover with the body; and the window in the cover with the LED of the live circuit indicator module.

When the cover is positioned over the top portion of the body, the live circuit detector module 40 and back cover 50 of the plug are located within the cover.

Fig. 3 is a side elevation view of the back cover 40 of the plug. The openings 30 are sized to receive the conducting wires of the cable which supplies power to the prongs of the plug. The back cover has two passageways for receiving spring contacts. The openings are positioned to be in alignment with the top of the blades which are to be connected to the line conductors and with the clip contacts 52, 54 (see Fig. 4) of the LED/resistor/diode circuit located on the live circuit indicator module when the live circuit indicator module is positioned onto the top of the back cover.

Referring to Fig 4, there is shown the top of the live circuit indicator module 40. The module has three openings 56 sized to receive the projections 58 (see Fig. 3) into which the conducting wires of the cable are located. Located on the top surface of the module is the series circuit for detecting the presence or absence of power at the prongs of the plug. The circuit comprises a conductive pad 52 connected to a diode 58, which can be an IN40D5; an LED 60; a resistor which can be a 1/4 watt 30K ohms; and a second conductive pad 54, all connected in series. The LED is positioned to be aligned with and located behind the window 14 in the cover when the plug is assembled. The pads 52, 54 are positioned to be in alignment with the top of the passageways in the back cover which contain spring contacts. When the live circuit indicator module is positioned on top of the back cover, the conductive pads 52,54 make electrical contact with the tops of the two prongs connected to the line conductors by means of contact springs located within the openings in the back cover. Thus, a series circuit is established from the top of one line connected prong through pad 52, diode 58, LED 60, resistor 62, and pad 54 to the top of the other line connected prong.

In operation, the LED is on when power is applied to the line connected prongs, and the LED is off when the line connected prongs are not connected to a live source of power. Thus, with this invention, a break in either of the line conductors, even at the very top of the prongs will be indicated by the on-off state of the LED.

Referring to Fig. 5 there is shown a side elevation view of the top portion of cover 12 of the plug. The cover contains a window which is aligned to allow light from the LED to pass through for viewing by a user. A clear or colored lens can be positioned in the opening to prevent moisture and dirt from entering the interior of the plug and allow a user to see if the LED is on or off. If desired, the lens can be colored green or red or another color to emphasize the state of operation (conductivity) of the plug. The top of the cap supports a cable clamp to prevent the conductive cable from being pulled out of the plug.

Fig. 6 is a side elevation view of the body of the plug without the line circuit indicator module and the cover and showing the two spring contacts 62,64. Spring contacts 62, 64 are located in the passageways of the back cover to electrically connect the conductive pads 52, 54 to the tops of the prongs of the plug that are connected to the line conductors.

Fig. 7 is a side elevation partially exploded view showing the live circuit indicator module about to be position on the top of the back cover. The back cover and the live circuit indicator module have alignment means to insure that the spring contacts 62, 64 make electrical contact with the tops of the prongs of the plug that will be connected to the line conductors. The same or another alignment means also insures that the LED will be in alignment with and located behind the window in the cover when the cover is attached to the body of the plug to permit light from the LED to be seen by a user.

Fig. 8 is a side elevation view of the body of the plug body showing the live circuit indicator in position on top of the back cover. The live circuit indicator module can be heat staked to the back cover or held in place by screws, epoxy or the like.

Fig. 9 is an exploded elevation view of the body of the plug showing the two contact springs about to be inserted into the passageways in the back cover to make

contact with the tops of the prongs which are to be connected to the line conductors. Thereafter, the line circuit indicator module is placed on top of the back cover and, by means of alignment means, the conductive pads 52, 54 are located to make contact with the tops of the spring contacts to electrically connect the series circuit on the live circuit indicator module across the two prongs of the plug which are to be connected to the line conductors.